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„Do It Yourself”
Irrigation system planning and installation manual

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Introduction

Dear Reader!

We made these notes to provide you support to make your garden more beautiful. Here you can find any of the important steps, which are necessary to assembly, your own irrigation system.
However, we have to mention that if you need a professionally shaped and accordingly optimized beautiful garden, than you have to ask further instructions from a professional, who is specialized to this field.

Good luck for your work!

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I. Recording data

In this chapter we are going to discuss the information, which is CERTAINLY necessary to be recorded to design an irrigation system.

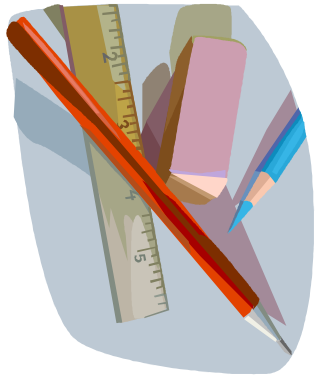
Two important things are indispensable:

1. Exact and scale site plan
2. Discharge measurement

If any information is missing, the work can not be continued!!!

I/1. Site plan

Indispensable for designing!

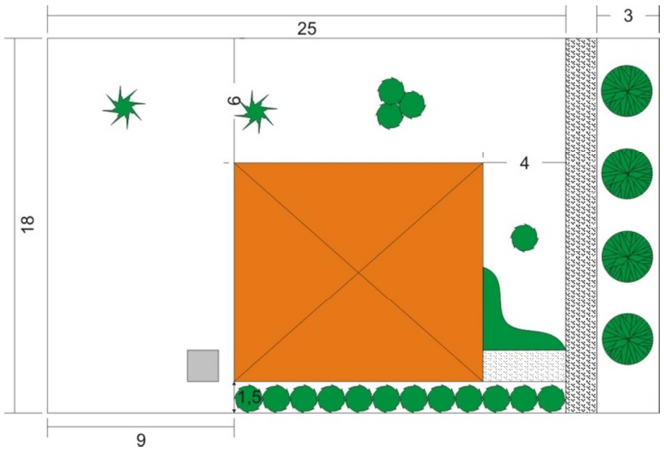


You will need the following tools:

- graph paper
- pencil
- eraser
- ruler
- tape measure

The following things must be indicated on the plan:

- the boundary of the area which you want to irrigate
- segments which not require irrigation (building, car entrance and parking place, road, grill place, playing ground, etc.)
- trees and bushes
- plant groups and flowerbeds
- location of the water source
- planned location of the irrigation controller device
- gradient of the area
- scale and northward direction
- if it is possible the ruler wind direction



Try to be as accurate as it possible, because later this will help you a lot.

I/2. Discharge measurement

Indispensable for planning!

A water source can be:

1. well with pump: its advantage is the lower cost of operation, but this method require special water treatment and more attention
2. potable water system: its advantage is the computability and this method don't require any filtering, but it is expensive

Regardless, the irrigation is based on well or potable water system, the procedure of measurement is the same.

Necessary tools:

- pressure-gauge
- ball-valve
- 10 liter of bucket (there is no need for any specialty)
- stopwatch

The procedure of measurement:

1. Install the pressure-gauge and the ball-valve (**1. picture)** to the pump or to the junction where you want to connect your irrigation system.
2. In order to let the water flow freely, open the ball-valve and start the pump (If you are planning a system to potable water take care of that all of the other valves be closed in order to get the most accurate measurement result).
3. Begin to close the valve which is mounted after the pressure-gauge until it will display 3 bar pressure.
4. Measure with the stopwatch, how much time is needed to fill up the bucket.
5. Calculate your available discharge:

$$\frac{measured\ amount\ of\ water(liter)}{measured\ time\ (\mathrm{sec})} * 60 = discharge\ (l/min)$$

6. Write the value into the calculation auxiliary table

1. Picture: Discharge measurement device

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II. Planning

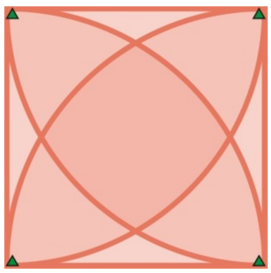
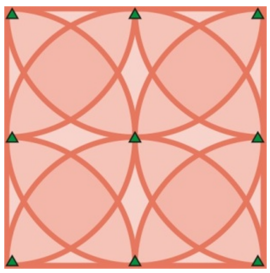
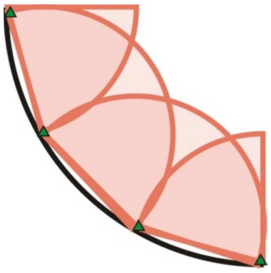
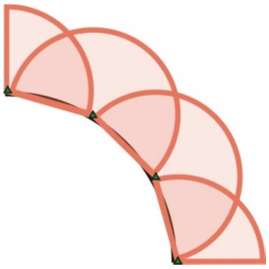
After all of the necessary information has been gathered, the plan of the irrigation system has to be made. You can choose between two possibilities:

1. Deliver the site plan and the result of water measurement to the colleagues of Poliext Csövek Kft. by post or in e-mail, and we are going to plan and calculate the cost of your irrigation system for free.
2. You will prepare the plan and the list of materials individually

If you want to plan by yourself, then you have to be aware of some basic rule:

1. You have to plan every time from sprinkle to sprinkle. The next one has to be located where the dispersion radius of the previous one ends. Preferably it is better to install one more sprinkle, than leave a place uncovered. **(2. picture)**
2. Every time try to install sprinklers with the greatest possible dispersion range, which is suitable for the current area
3. Begin the planning procedure from a corner, and move around the area, only then begin to plan the inner parts
4. Consider that a tree or a bush shades the area behind itself
5. Flowerbeds not necessary to be irrigated with sprinklers, consider the possibility of dripping

2. picture: Irrigation designed from sprinkler to sprinkler **3. picture: tracking curves**

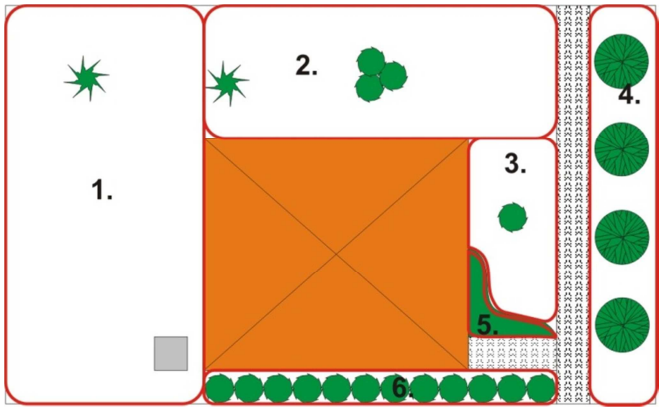





Steps of planning:

1. Divide into some logical parts the area which you want to irrigate. This has role in perspicuity. (**4. picture**)
2. Cover each of the logical units with sprinklers. The table on the backside is giving help for this. (**5. picture**)
    a. set your bows to the radius of the chosen sprinkler

b. draw a curve with the chosen radius
c. mark the positions of the sprinklers
d. write aside to each of them the type of the sprinkler and the water consumption on the used angle
e. continue this activity until the whole area is going to be covered

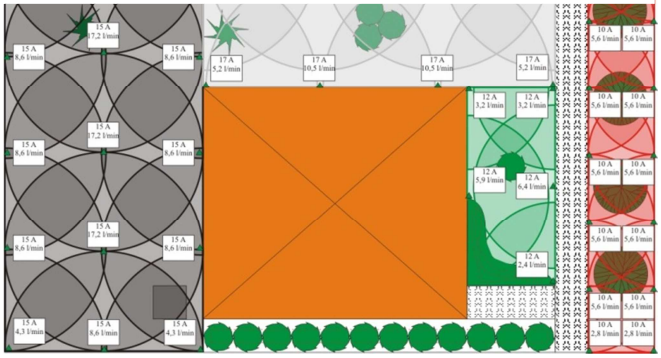
4. picture: Dividing of the irrigation area



!!!IMPORTANT!!! do not let any area uncovered, design from radius to radius!!!

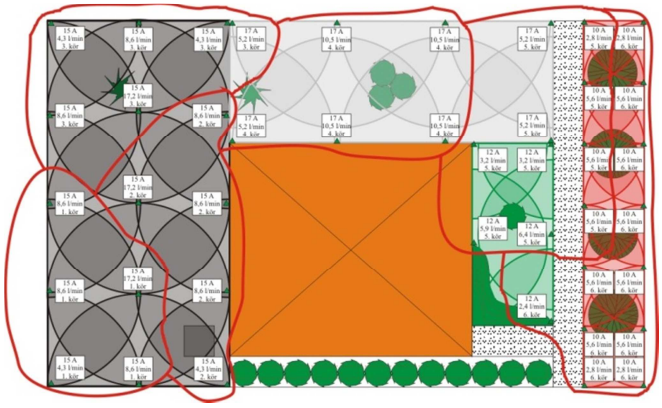
3. Mark those areas, which you want to irrigate with drippers instead of sprinklers.
4. Calculate the total amount of water consumption of the sprinklers. Write this value into the auxiliary table. (**10. picture**)
5. Determine how many dripping pipe will you need, and also write it into the auxiliary table.

5. picture: Positioning sprinklers



6. Make the calculations. The numbers have to be rounded up every time, this is a really important thing when you are assigning the irrigation circles.
7. Form groups of sprinklers considering their water consumption, take care of any of the group water consumption never exceed the total available discharge rate, and possibly this value be around the average consumption level of the other sprinkler groups. If there is more than 2m of vertical difference on the field, aspire to form groups of sprinklers on the same ground level. (**6. picture**)

6. picture: Assigning sprinklers



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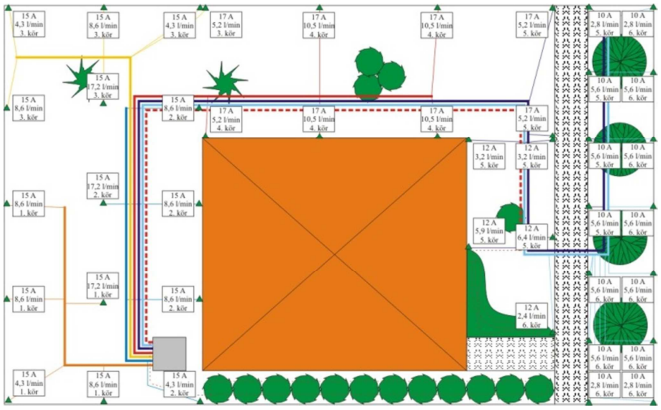
8. Mark each of the sprinkler group's pipe system. (**7. picture**)

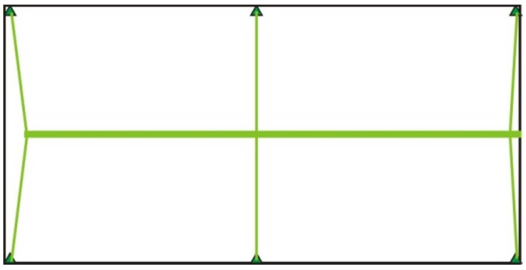
a. Sprinklers are recommended to install to the main pipeline with a thinner sprinkler connection pipe in fishbone form. The reason of this method is simple, it is easier to work with a thinner pipe and suit the sprinkler to the surface.

7. picture: Pipe system

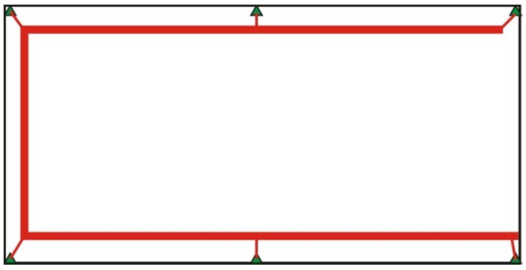


b. According to this way of installation, the thick pipe is forwarding the water near to the sprinklers, and junction is installed with thinner pipes.

8. picture: Appropriate sprinkler installation



9. picture: Inappropriate sprinkler installation



c. The junctions of the dripping system are recommended to install similarly.

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10. picture: Auxiliary table for calculating

Designation	Value	Comments
Discharge of the water source	l/min	
Total consumption rate of sprinklers	l/min	
Number of sprinkler sub-lines	piece(s)	$\frac{Total\ water\ consumption\ of\ sprinklers}{Discharge\ rate\ of\ the\ water\ source}$ Rounded up to integer
Average water consumption rate of sprinkler sub-lines	l/min	$\frac{Total\ water\ consumption\ of\ sprinklers}{Number\ of\ sprinkler\ sub-lines}$ Rounded up to two decimal
Length of the dripping pipes	m	
Water consumption of the dripping pipe	l/min	$length\ of\ dripping\ pipe\ x\ 0{,}2$
Number of dripping sub-lines	piece(s)	$\frac{Water\ consumtion\ of\ dripping\ pipe}{Discharge\ rate\ of\ the\ water\ source}$ Rounded up to integer
Average length of dripping pipe in sub-lines	m	$\frac{Lenght\ of\ dripping\ pipe}{Number\ of\ dripping\ sub-lines}$
Total number of sub-lines	piece(s)	*Total number of sprinkler sub-lines + Total number of dripping sub-lines*

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III. Compilation of the list of materials (11. picture)

After you finished the planning of your irrigation system, you have to compile the list of the necessary parts and materials. We made this significantly easier for you, because the necessary materials were organized into unit packages.

The procedure of compilation of materials:

1. Mark that what do you want to use as a water source a potable water system or a pump
2. Measure how many thick pipe do you need for the trunk-line
3. Measure how many thin pipe do you need to connect your sprinklers
4. Write these values into the list of materials
5. Write into the table the previously determined amount of dripping pipe
6. Count how many pieces of sprinklers were used from each type, write the values into the correct places of your table
7. Count how many dripping junction will you need, and also write the value into the material demand “Number of sub-lines” field
8. Write the total number of irrigation sub-lines into your auxiliary table’s “Number of sub-lines” field
9. According to the number of sub-lines choose the correct controller
10. Mark that are you willing to install rain sensor, or not
11. If valves are not going to be placed into a currently existing valve box, please mark the last item in your auxiliary table
12. Measure the distance between the valve box and the controller. The number of wires in the control cable has to be one more than the total number of valves. (*e.g.:* 6 valves + 1 = cable with 7 wires)

After the preliminary table of materials has been finalized, please send it to the colleagues of Poliext Csövek Kft., in order to that they could prepare our personal offer, and be able to contact with you.

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11. picture: Material demands

Customer information:

- Name (company name):
- Address:

- Telephone number:
- Fax:
- E-mail:

Designation	Amount
I. Starting stockpile	
- potable water system staring kit	❑
- pump starting kit	❑
- fertigation system	❑
II. Pipes	
- ø 32 trunk-line pipe	m
- ø 20 sprinkler connection pipe	m
- dripping pipe	m
III. Sprinklers	
- 8A sprinkler kit	piece(s)
- 10A sprinkler kit	piece(s)
- 12A sprinkler kit	piece(s)
- 15A sprinkler kit	piece(s)
- 17A sprinkler kit	piece(s)
- dripping offset	piece(s)
IV. Controller	
- Number of sub-lines	piece(s)
- 4 station controller	❑
- 6 station controller	❑
- 8 station controller	❑
- 3 station expandable controller (expandable up to 12 stations)	❑
o 3 station expansion module	piece(s)
- Rain sensor demand	❑
- Valves will be installed into a separated valve box	❑
- Length of controller cable (…… wires)	m

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IV. System installation

If everything goes well, soon you will get the parts and materials, which are necessary to assembly your irrigation system. After this, the installation of the system can be started.

IV/1. Appointing digging line

According to the previously made blueprint, with the help of a tape measure and spikes designate the future place of the sprinklers. Take care of that, the sprinklers are going to be positioned exactly, where they had been planned. After the positioning of the sprinklers, it is worthy to designate the place of the whole pipe system with some lace.

IV/2. Digging the trench

If we are working on a grassy field, our advice is to use a foil stripe to make easier to put back the removed soil. Cut the grass into square pieces and put it on one of your sides and the soil to the other one. If the area is not covered by grass, but it has been already prepared for this, then put the upper, best quality part on one of your sides and the lower quality subgrade to the other side. Digging deepness: 40-50 cm. Take care of that, the land be a bit aslope to the direction of the valve box.

IV/3. Laying of pipes

After you dig the trenches, lay down the ø32 mm pipes. For cutting, use a special pipe scissor or a sharp knife. Take care of the safety of your hands. You can find end plug in the valve kit, this can be used to close the end of the pipe. Write onto the pipes numerous times, which pipe sub-line are they belonging to, later, when you are going to install the sprinklers, this will provide important information for you. Lay the pipes side by side into the trench. Try to avoid crosses in the pipe system.

IV/4. Installing sprinklers

The unit package includes all of the parts and materials except pipes, which are necessary to install a sprinkler. Pipes have to be cut to length every time. Steps of assembly:

1. Install the clamp saddle onto the ø32 mm pipe, turn its threaded side into the direction of the sprinkler
2. Drill the pipe via the threaded part of the clamp saddle. Avoid causing any damage in the threads or in the other side of the pipe

3. Coil 20 round of PTFE up to the threaded side of the HPE fitting, and then coil it into the clamp saddle until you can do it by hand
4. Coil 7 round of PTFE up to the threaded side of the HPE fitting, and then coil it into the bottom part of the sprinkler. Do not strain it, because the lower side of the sprinkler can be slit.
5. Connect the ø20 mm pipe to the elbow fitting.
6. Set the sprinkler to its final position, right height, and fix it with some soil
7. Unroll as much ø20 mm pipe as you need to connect the sprinkler to the offset at the trunk-line pipe. Cut it, and then connect it.

After you finished installing all of the sprinklers, cover in trenches. Perform an accurate sealing, in order to avoid the depression of the previously removed soil in the future.

IV/5. Assembling valve joints and binding up water source

A starting kit for binding up water source is containing all of the necessary parts, which are you going to need, and also containing the drainage kit. It may occur that some places have to be completed with ø32 mm pipe.

The valve kit contains all of the necessary parts to from junctions, assembly everything according to the attached assembly manual. It is worthy to pull the PTFE covered parts, with some kind of a clamp, but it is enough if the other parts are pulled by hand.

Connect the ø32 mm pipe to the outbound side of the valve. Install the control cable to the coils of the valve with water-protected connectors according to the manual of the controller device. Test the system under pressure, and check it whether there is any dripping. If it is necessary pull each of the sealing again, or re-seal them.

If you have any question or problem, please call the colleagues of Poliext Csövek Kft., they are willingly available for you.

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V. Setting, programing

After you finished assembling your system you have to set the sprinklers and the controlling device.

V/1. Sprinkler setting

The sprinklers can be set by hand, and this procedure does not require any kind of special tool

1. On the top of the sprinkler there is a point, which one shows the fix point of it, and its mouth. Pull out the middle part of the sprinkler from its body.
2. Grab its neck and turn it away so that its point is in the right side of the sprinklers dispersion angle. You will hear scratchy noise, but this is normal.
3. After this grab the top of the nozzle and turn the small point to the left side of the dispersion angle.
4. Let it off, so that it will draw back to its body.
5. After you started the irrigation you can easily revise the angle according to the method written above, even during the operation of your system.
6. If the sprinkler's dispersion radius is larger than the requiring one, then you can decrease it by 25% with the bolt which is on the middle of the nozzle.

V/2. Setting of controller device and irrigation time

Steps of controller device programing are written in its manual.

It is worthy to time the beginning of irrigation during the night hours, so that it doesn't disturb moving at daytime, decrease the heat stress of your plants and decrease the loss of evaporation. To determine the time of irrigation there are several parameters, which have to be considered:

- soil composition
- water demands of plants
- the area is sunny or shady
- wind conditions
- seasons

The general program for May is to operate each of the sprinkler sub-lines 2 times of a day for 8 minutes, and drippers one time of a day for 30 minutes. This can be notably different, because of the parameters listed above, so in order to get correct information ask for the help of the colleagues of Poliext Csövek Kft.

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VI. Maintenance

This thing is also important to be mentioned. An irrigation system can only be effective if you pay attention to it. It is worthy to check the time of irrigation and the condition of the filter. Frequently complement the fertilizer in your fertigation system.

At the beginning of the season the whole system has to be revised, the conditions of the sprinklers have to be checked and if it is necessary its dispersion angle and radius have to be corrected.

At the end of the season the system has to be drained. In order to this close the water source, or in case of a pump also drain and then put it to a place which is protected against frost. Take out the cartridge from the filter, clean it, and then put it back to its original place until springtime. Open the drainage valve. If you installed your system correctly, then the water will flow back from the sprinkler to the valves. If this is not happening, then it is proposed to blow out the water from the system with the help of a compressor, which you can connect to the drainage valve. The valves can be opened by hands with the small white arm on the top of them. Turn off the controlling device.

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Sprinkler parameters

Angle	Discharge (l/min)				
	8A (2,1m)	10A (3m)	12A (3,7m)	15A (4,6m)	17A (5,2m)
45°	1,4	1,4	1,6	2,2	2,6
90°	2,8	2,8	3,2	4,3	5,2
120°	3,7	3,7	4,2	5,7	7,0
180°	5,6	5,6	6,4	8,6	10,5
240°	7,4	7,4	8,5	11,5	13,9
270°	8,3	8,3	9,5	12,9	15,7
360°	11,1	11,1	12,7	17,2	20,9